PCT/EP2003/010166

Translation

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference M/43274-PCT	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/EP2003/010166	International filing date (*day/month/year*) 12 September 2003 (12.09.2003)	Priority date (*day/month/year*) 13 September 2002 (13.09.2002)
International Patent Classification (IPC) or national classification and IPC C07C 45/50		
Applicant BASF AKTIENGESELLSCHAFT		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 13 February 2004 (13.02.2004)	Date of completion of this report 16 December 2004 (16.12.2004)
Name and mailing address of the IPEA/EP Facsimile No.	Authorized officer Telephone No.

Form PCT/IPEA/409 (cover sheet) (July 1998)

International application No.
PCT/EP2003/010166

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

I. Basis of the report

1. With regard to the elements of the international application:*

☐ the international application as originally filed

☒ the description:
pages 1-50, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

☒ the claims:
pages 1-11, as originally filed
pages _____, as amended (together with any statement under Article 19
pages _____, filed with the demand
pages _____, filed with the letter of _____

☒ the drawings:
pages 1/11, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

☐ the sequence listing part of the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:
☐ the description, pages _____
☐ the claims, Nos. _____
☐ the drawings, sheets/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rule 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.*

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/EP 03/10166

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-11	YES
	Claims		NO
Inventive step (IS)	Claims	1-11	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-11	YES
	Claims		NO

2. Citations and explanations

(Assuming the priority claimed by the present application to be valid (the relevant priority document not being available), the P documents, D1 to D5, cited in the search report do not constitute prior art under the PCT examination procedure (PCT Article 33(2) and (3); see PCT Rule 64).)

Thus, the following prior art documents remain to be taken into consideration:

D6: WO-A 01/58589

D7: US-A 5710344.

The invention relates to a catalytic method for producing dialdehydes and/or ethylenically unsaturated monoaldehydes by reacting at least one compound with at least two ethylenically unsaturated double bonds with CO and H_2. An essential structural feature of the catalysts of general formula I (claim 1), as used according to the invention, appears to lie in the special definition of the terminal groups $-PnR^1R^2$ and $-PnR^3R^4$, according to which at least one pyrrole group is covalently bound to each pnictogen atom ("Pn") via the nitrogen atom of the pyrrole

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group (see the corresponding "condition" in the definition of the R^1 to R^4 groups in claim 1).

Document D6, the closest prior art, likewise describes suitable catalysts for hydroformylation reactions, dienes (e.g. 1,6-heptadiene or 1,7-octadiene) also being explicitly named as potential substrates (see page 26, second paragraph). The general catalyst definition in D6 includes catalysts that have a bridged polycyclic core structure (formula I) to which are bound two groups, Y^1 and Y^2, each group having one "pnictogen atom", that is to say P, As or Sb. Y^1 and Y^2 preferably stand for, *inter alia*, a phosphorus atom with groups of, for example, the $-PR^6R^7$ type (or oxygenic analogues thereof), wherein R^6 and R^7 can also mean hetaryl (e.g. pyrrole) (see D6, claim 1 and page 5, lines 19-21, page 6, lines 25-35 and page 10, lines 4-11 of the description). However, D6 gives a more explicit description of the use of phosphoric compounds with groups <u>other</u> than P-bound hetaryl groups (see D6, pages 14-17; the examples). Less explicitly disclosed in D6 is also the structural feature characterised as the aforementioned "condition" (see claim 1) of the catalyst structures to be used according to the invention. The novelty of the method claimed in the present application can thus be acknowledged (PCT Article 33(2)).

This assessment is likewise valid in relation to the teaching of D7, which discloses differently structured hydroformylation catalysts (see the core structure).

Since the teaching of D6 in its entirety would tend to guide a person skilled in the art to the use of <u>aryl</u>-substituted Pn chelate ligands (see the description,

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pages 14-17; the examples; the claims in their entirety), the critical significance of the essential structural feature of the hydroformylation catalysts to be used according to the invention (see above) cannot be derived therefrom in an obvious manner. This also applies, in particular, to the catalyst group that is additionally defined by a bridging group Q, in which Q stands for a xanthene-diyl group (S, or Si analogues thereof) (see compounds 1-43, page 24 ff.; the examples, page 48 ff.). No such structural modification of the core part is in any way suggested in D6.

Although D7 also proposes phosphoric chelate ligand complexes with pyrrole groups for the hydroformylation of dienes, said complexes differ structurally from the catalysts used according to the invention by virtue of the totally different nature of the core structure, which consists of 1,1'-biphenylene- or 1,1' binaphthalene units. In the light of the available prior art, therefore, the subject matter of the claim can also be considered to involve an inventive step (PCT Article 33(3)).